

What is claimed:

1. An assembly to use in a projection screen, the assembly comprising:
a metal reflective surface; and
a layer above the metal reflective surface to reduce an amount of difference in reflectivity of the metal reflective surface for incident light polarized in two different directions.
2. The assembly of claim 1 in which the layer reduces an amount of difference in reflectivity of the assembly for two polarizations of light.
3. The assembly of claim 1 in which the layer above the metal reflective surface has a nominal thickness between 50 and 200 nm.
4. The assembly of claim 1 in which the layer above the metal reflective surface has a nominal thickness between 60 and 75 nm or between 170 and 190 nm.
5. The assembly of claim 1 in which the layer above the metal reflective surface comprises at least one of an oxide, silicon oxide, silicon dioxide, or titanium dioxide.
6. The assembly of claim 1 in which the layer comprises a protective layer that is harder than the metal reflective surface.
7. The assembly of claim 1 in which the assembly, measured from a side of the assembly proximate to the protective layer, has a hardness greater than HB using a pencil hardness scale.
8. The assembly of claim 1 in which the metal reflective surface has a thickness less than 200 nm.
9. The assembly of claim 1 in which the metal reflective surface comprises at least one of aluminum, silver, titanium, and niobium.

10. The assembly of claim 1 in which the metal reflective surface covers at least a portion of the assembly that receives a projected image when used in the projection screen.

11. The assembly of claim 10 in which the layer above the metal surface covers more than 50% of the metal reflective surface.

12. The assembly of claim 1 further comprising a substrate to support the metal reflective surface.

13. The assembly of claim 12 in which the substrate has surface features such that when surface angles of the substrate surface are measured along a specified direction, the percentage of surface angles in the range of -40 to -20 degrees together with surface angles that are in the range of 20 to 40 degrees is greater than 5%.

14. The assembly of claim 13 in which the surface features have dimensions in a range of 0.5 to 500 μm .

15. The assembly of claim 13 in which the surface features have dimensions in a range of 1 to 100 μm .

16. The assembly of claim 13 in which the percentage of surface angles in the range of -90 to -40 degrees together with surface angles that are in the range of 40 to 90 degrees is less than 5%.

17. The assembly of claim 16 in which the surface features have dimensions in a range of 1 to 100 μm .

18. The assembly of claim 1 in which the layer above the metal reflective surface comprises multiple sublayers.

19. The assembly of claim 1 further comprising another layer to improve stain resistance.

20. The assembly of claim 19 in which the layer to improve stain resistance comprises at least one of silicone and fluorocarbon.

21. An assembly for use in a projection screen comprising:
a metal reflective surface;
a protective layer above the metal reflective surface, the protective layer comprising a material and a thickness that reduces depolarization of light reflected from the metal reflective surface; and
a substrate to support the metal reflective surface, the metal reflective surface having surface features such that when surface angles of the metal reflective surface are measured along a specified direction, the percentage of surface angles in the range of -40 to -20 degrees together with surface angles that are in the range of 20 to 40 degrees is greater than 5%, the surface features having dimensions in a range of 1 to 100 μm .

22. The assembly of claim 21 in which the combination of the substrate, the metal reflective surface, and the protective layer has a hardness greater than HB using the pencil hardness scale as measured from a surface of the protective layer.

23. An apparatus to use in a projection screen, the apparatus comprising:
a surface having surface features such that when surface angles of the surface are measured along a specified direction, the percentage of surface angles in the range of -40 to -20 degrees together with surface angles that are in the range of 20 to 40 degrees is greater than 5%, and the percentage of surface angles in the range of -90 to -40 degrees together with surface angles that are in the range of 40 to 90 degrees is less than 5%, the surface having a reflectance greater than 70% for light having a wavelength between 400 nm and 700 nm, the surface features having dimensions smaller than 1 mm, and
a substrate to support the surface.

24. The apparatus of claim 23 in which the surface features have dimensions in a range of 1 to 100 μm .

25. The apparatus of claim 23 further comprising a substrate to support the surface.

26. The apparatus of claim 25 in which the substrate comprises plastic or a polymeric coating on plastic.

27. The apparatus of claim 23 in which surface comprises a metal reflective surface.

28. The apparatus of claim 23 in which the percentage of surface angles in the range of -40 to -20 degrees together with surface angles that are in the range of 20 to 40 degrees is greater than 10%.

29. The apparatus of claim 23 in which the percentage of surface angles in the range of -90 to -40 degrees together with surface angles that are in the range of 40 to 90 degrees is less than 2.5%.

30. The apparatus of claim 23 in which the percentage of surface angles in the range of -90 to -50 degrees together with surface angles that are in the range of 50 to 90 degrees is less than 3%.

31. The apparatus of claim 23 in which the reflectance of the apparatus is greater than 50% for viewing angles between -32 to 32 degrees.

32. An apparatus comprising:
a projection screen having a metal reflective surface and a silicon oxide protective layer above the reflective surface.

33. The apparatus of claim 32 in which the silicon oxide protective layer has a nominal thickness in a range of 50 to 200 nm.

34. A method for producing a assembly for use in a projection screen, comprising:
providing a metal reflective surface; and
placing a layer above the metal reflective surface to reduce an amount of difference in reflectivity of the assembly for two modes of polarized light.

35. The method of claim 34 in which the two modes of polarized light comprises a first mode in which light is linearly polarized along a first direction and a second mode in which light is linearly polarized along a second direction, the second direction being perpendicular to the first direction.

36. The method of claim 34 in which the layer above the metal reflective surface comprises a protective layer that is harder than the metal reflective surfaceassembly.

37. The method of claim 34 further comprising placing another layer on the protective layer to improve stain resistance.

38. A method comprising:
projecting an image on a projection screen having surface features and coatings configured such that the reflectance of the surface of the projection screen is greater than 50% for horizontal viewing angles between -32 and 32 degrees, as compared to the reflectance at zero degree, and the amount of depolarization is less than 1%.

39. The method of claim 38 in which the surface features are configured such that when surface angles of the surface are measured along a specified direction, the percentage of surface angles in the range of -40 to -20 degrees together with surface angles that are in the range of 20 to 40 degrees is greater than 5% and the percentage of surface angles in the range of -90 to -40 degrees together with surface angles that are in the range of 40 to 90 is less than 5%.

40. The apparatus of claim 39 in which the surface features have dimensions in a range of 1 to 100 μm .